times when the condition is well-developed a fine rain falls covering everything with a coat of glaze ice.

At such times an examination of the weather map shows we are to the north of the axis of a trough of low pressure and that but a little way south of us warm west to southwest winds are blowing and no doubt overriding this cold northerly air, producing the clouds and sometimes rain. As a rule this condition is followed by a shift of wind to SW. and a rapid rise in temperature, the clouds all disappearing.

BOUNDARY BETWEEN A SOUTH WIND AND AN UNDERRUNNING NORTHEAST WIND.[1]

By CHARLES F. BROOKS.

[Blue Hill Observatory, Mass., May, 1913.]

In the late afternoon and evening of May 3, 1913, an anticyclone began to approach Blue Hill from the north. During the day a sea-breeze of three hours' duration had prevented the maximum temperature (80°F.) from occurring until the middle of the afternoon at the summit of the hill (195 m.). The wind remained in a southerly direction till 9 p. m. with momentary exceptions, marked by sharp drops in the thermograph curve.

The wind at the base station (64 m.) became northeast at 5:20 p. m. and therefore for several hours a considerable temperature inversion existed between the base and summit, at one time amounting to 14°F. At 7 p. m. the dividing line between the northeast wind and the south-southeast wind was across the summit of the hill in an east-west direction. This line was very sharp, so-sharp that I could stand with the breeze from the northeast blowing on one cheek and that from the south on the other. At this time, as shown by the oscillations of the hygrograph curve up and back again whenever a small volume of northeast wind blew through the instrument shelter, the relative humidity on the dividing line was 80 per cent on one side (northeast) and 40 per cent on the other (south).

With the normal evening cooling the humidity presently reached 100 per cent on the dividing zone, thereby producing a fog. The pressure began its rapid rise at this time. Before long the stratus cloud rose from the top of the hill (3 a. m., by hygrograph), and by 7 a. m., May 4, was some distance above, its appearance giving an inverse "mammato" effect. At about noon the sun first broke through the cloud sheet, and by sundown most was gone.

(NOTE.--Another occasion on which I observed a similar sharp dividing line between winds from two directions was on July 25, 1912 near the Schilthorn, Switzerland. In the late afternoon, when there were thunderstorms in the vicinity, a cloudy current coming up the south side of a ridge on the east met a clear current up the north side with the result that a vertical cloud wall perhaps 100 meters high was formed.)

[1] *See* C. F. Brooks, Three ice storms, *Science*, Aug. 8, 1913, pp. 193-194, for descriptions of somewhat similar conditions.

THE PRECIPITATION OF SLEET AND THE FORMATION OF GLAZE IN THE EASTERN UNITED STATES, JANUARY 20 TO 25, 1920, WITH REMARKS ON FORECASTING.

By C. LEROY MEISINGER.

[Weather Bureau, Washington, D. C., Mar. 29, 1920.]

SYNOPSIS.

An attempt is made, by means of accurate charts of precipitation during the previous 12 hours, current temperature, pressure, and lines of wind flow, in combination with such aerological data as could be obtained, to construct cross-sections of the lower 3 kilometers of the atmosphere, during the period January 20 to 25, 1920. From such charts are shown the actual processes which produce rain, sleet, and snow, separately and in combination, in such a manner as to produce the ice cover, which is called an "ice storm." The condition is, briefly, a cold northerly wind underrunning a warm southerly current, forcing the latter aloft. The vertical distribution of temperature, shown in the cross-sections, indicates the manner in which the isotherms in that territory covered by the northerly wind rise normally until the level of the overrunning southerly wind is attained, where the isotherm swerves sharply northward. The distance that the isotherm of freezing reaches is indicated by the northern limit of the precipitation of sleet.

An empirical relation was obtained between the distance from the wind-shift line to the 32° isotherm and (1) the width of the glaze belt, (2) the width of the sleet belt, (3) the distance of the center of the sleet belt north of the 32° isotherm, (4) the width of the glaze belt on a meridian 4° east 12 hours later, and (5) the width of the glaze belt on a meridian 8° east 24 hours later. These values are presented with the full realization that they may be true for this particular storm only, and are as follows:

(1) The width of the glaze belt=the distance between the 32° isotherm and the wind-shift line;

(2) The width of the sleet belt=0.7 × the distance between the 32° isotherm and the wind-shift line;

(3) The distance between the 32° isotherm and the center of the sleet belt=0.8 × the distance between the 32° isotherm and the wind-shift line;

(4) The width of the glaze belt 4° east, 12 hours later=0.9 × the distance between the 32° isotherm and the wind-shift line; and,

(5) The width of the glaze belt 8° east, 24 hours later=0.8 × the distance between the 32° isotherm and the wind-shift line.

The importance of the wind-shift line in forecasting the region over which sleet or glaze are likely to occur is strongly emphasized, since it marks the point of ascent of the southerly wind and hence is the basis upon which rests the location of this type of precipitation.

INTRODUCTION.

Of all types of storms, there are few which have the wide-spread economic effects of the so-called "ice storm." Not only is traffic, both on railroads and in cities, impeded and often completely tied up, and telephone and telegraph lines crippled, but accidents are numerous also. Moreover, when rain falls on a region previously covered with snow and produces an ice glaze, the snow is held immovable and the glaze forms a gliding surface over which subsequent snow will drift with little hindrance. In New York City recently, when the streets were more effectually blockaded by snow than at any time in the city's history, not a small part of the difficulty in its removal was attributable to the fact that there had been layers of ice formed at various levels in the snow, increasing the rigidity of the drifts and packing them more solidly.

Often such storms are local and do not have a wide-spread effect, but once or twice in a winter they occur over a large area of the country. They are caused, of course, simply by the precipitation of rain upon a region the temperature of which is at freezing or below. In many cases, it is not long before all surfaces exposed to the rain become heavily coated with a crystal-clear layer of ice, sometimes as much as an inch in thickness. This